Farm Management FACTS

Water Series No. 1

The Economics of Converting Wetlands to Croplands

Purpose

The purpose of this publication is to outline the key elements landowners should consider when deciding whether or not to drain a slough to create more cropland.

Using this publication

This publication can be used by landowners without assistance from extension staff, although local extension agrologists, Sask Water or Saskatchewan Environment and Resource Management staff would be able to provide advice on local landscape conditions to help make decisions easier.

How can I determine my costs and benefits?

Generally, producers perceive two types of benefits from draining and cultivating wetlands. First, crops can be grown in the converted area to increase production and the cultivated acreage base. Second, large machinery is awkward to manoeuvre around and between wetland areas, and equipment overlap results in increased input costs and inefficiency.

However, as with most changes to the landscape, there are costs to get these perceived benefits. The costs involve 1) direct costs to the landowner, 2) indirect costs, such as reduced soil productivity, and 3) off-farm costs to neighbours and others in a drainage basin.

It is almost impossible to provide blanket recommendations that will cover all conditions for all individuals. However, this publication examines the issues surrounding wetland conversion and provides financial guidelines and a worksheet to help you determine your individual costs and benefits.

What are wetlands?

Wetlands are low-lying areas of land covered by water often enough to support aquatic plants and wildlife for part of their life cycle. In their natural state they include both the wet basin and an area of adjacent upland a minimum of 10 metres (33 feet) in width. Cropland that is occasionally flooded is not considered a wetland.

In Saskatchewan wetlands are known by many names, including sloughs, marshes, and potholes. In the past, small wetlands were considered

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wastelands and routinely drained or filled in. The loss of wetlands contributed to shortages of water, erosion of topsoil, and reduced productivity of agricultural land. Today, people are beginning to understand the critical roles wetlands play in balancing the essential components of soil, water, and wildlife habitat on the Saskatchewan landscape, and they are re-thinking how they manage these important areas.

Types of wetlands in Saskatchewan

1. Temporary/seasonal wetlands may contain water for a few weeks in the spring, or into late summer. They usually have shallow water and flooded vegetation.

2. Permanent wetlands contain water in all but the driest of years. They have flooded vegetation at the margins, and deeper, open water lacking vegetation.

3. Forested wetlands lie within large tracts of forest.

4. Mudflats are dry wetlands without vegetative cover.

Small - 0.1 - 4.9 acres (0.05 - 2.0 ha)

Medium - 5.0 - 99.0 acres (2.0 - 40.3 ha)

Large - larger than 100 acres (40.4 ha)

These categories do not include temporary wetlands in flat topography caused only by sheet water (snow melt or rains).

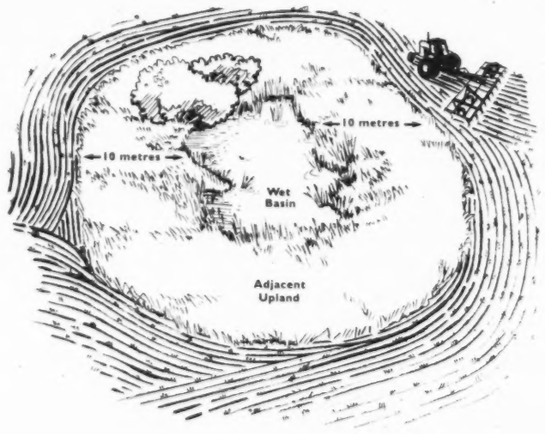
Over 80 per cent of Saskatchewan's wetlands are less than two acres in size and 30 per cent are less than one-tenth of an acre.

Why are wetlands drained?

Since the time of settlement in Saskatchewan, 40 per cent of our province's wetlands have been lost. Many of those left are threatened by human activities.

A number of factors affect wetland numbers: climate, water management, agricultural practices, urban development, transportation development, and government programs and policies.

A FUNCTIONAL WETLAND



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Wetland Conversion Costs

Costs vary greatly from farm to farm. Landowners should consider the following information as a guide when analyzing their situation.

The following tables include costs of operations associated with wetland conversion and sample production costs and returns for the major crops grown in Saskatchewan. These sample costs, or your actual costs, should be used in the worksheet to determine the net effect of wetland conversion on your farm.

The costs and effects of wetland loss are cumulative. Conversion of a single wetland may not be significant, while the loss of the majority of wetlands in a region may have serious effects. The sample worksheet portion of this fact sheet is a guide for landowners to determine the costs associated with converting a single wetland. To understand the effects of the loss of wetlands in a region, landowners should review the "Wetland Benefits To Producers" section of this fact sheet.

Typical On-Farm Drainage Costs in West Central Saskatchewan
(1989 dollars)

Topography	Type of Drainage	Cost/Reclaimed Acre	Cost/Reclaimed Hectare
Almost level, with depressions or occasional small hills	Random field ditches and grassed waterways	$400	$990
Rolling or hilly terrain	Random field ditches and subsurface drains (pothole drainage)	$550	$1,360
Almost level, with depressions or occasional small hills	Grid system drains	$1,030	$2,540
Level (sheetwater flooding)	Parallel field ditches	$60	$150

Source:
Adapted from Jensen Engineering (1985). Inventory of Alberta's Drainage Requirements - Engineering Summary Report. Estimates of costs for west central Saskatchewan provided by Cas Rogal, Saskatchewan Water Corporation, Outlook, Saskatchewan, March 1, 1990.

Machinery Costs Associated With Breaking Land

Machine	Size	Rental Rate
Bulldozers	100 - 500 HP	HP X .3132 = $/hr
Heavy Disc	10 - 12 ft	$14.81/ac
	14 -16 ft	$11.21/ac
Scrapers	5.5 - 6.5 yds	$79.82/hr
Plows	7.5 ft	$12.84/ac
	9 ft	$13.95/ac
Rock pickers	3 paddle hydraulic	$53.19/hr
Rotary mowers	6 -7 ft trailing	$34.69/hr
	10 ft trailing	$49.73/hr

Source:
Saskatchewan Agriculture and Food, Farm Machinery Custom and Rental Rate Guide 1993
Saskatchewan Highways, 1992-93 Equipment Rental Rates.

Tillage Costs

Machine	Size	Rate $/acre
Heavy duty cultivator	21 ft	$4.57
	25 ft	$4.35
	30 ft	$4.19
Tandem discs	12 ft	$5.66
	15 ft	$5.62
	20 ft	$6.64
Discers	15 ft	$7.40
	24 ft	$6.44
Harrows	50 ft	$1.78
	80 ft	$1.48
Sprayers	400 gal 70 ft	$1.73

Source:
Saskatchewan Agriculture and Food, Farm Machinery Custom and Rental Rate Guide 1993.

Wetlands: What does the inconvenience cost?

The costs of working around obstacles varies with the topography, where the obstacle is located in the field and the size of the obstacle. Obstacles in field corners or in areas that can be squared off are usually considered easier to work around.

The Prairie Farming Program contracted Accutrak Systems Ltd. of Regina, SK, to conduct a field efficiency study to determine the cost to farmers of working around various sized obstacles. Results showed that the cost of farming around obstacles is between **$23 and $28 per obstacle per year** regardless of the object's size.

Overlap Costs

Overlapping costs - $25 per obstacle per year

Source:
"A Study To Determine the Cost of Farming Around an Obstacle," for Prairie Farming Program by Accutrak Systems Ltd. December, 1991.

Costs of Production Per Acre (Cash Costs)

Soil Zone

Crop		Brown	Dark Brown	Black
alfalfa for seed				$41.31
barley	stubble		$56.22	$69.20
	fallow	$40.16	$64.94	
canola	stubble		$72.94	$100.77
	fallow		$63.26	$69.21
CPS wheat	stubble		$66.85	$87.05
	fallow	$47.17		
flax	stubble		$76.58	$71.50
lentils	stubble		$91.71	$101.14
	fallow		$110.03	
oats	stubble			$66.96
peas	stubble			$88.50
summerfallow		$13.06	$15.01	$18.74
wheat	stubble	$54.97	$56.51	$67.96
	fallow	$49.96	$53.10	$60.39

Source:
Saskatchewan Agriculture and Food, Cost of Producing Grain Crops in Saskatchewan, 1993.

Economic Worksheet — Wetland Conversion to Grain
(ten year period)

Advantages **Disadvantages**

Added Revenues	**Added Costs**
Gross Revenue = (a.)ac x (d.)bu/ac x (e.)$/bu x(b.)yrs harvested Agricultural Income Support Revenue (g.)$/ac x (a.) ac x (h.) yrs =	Operation Rate Cost Drainage Breaking Discing Rock picking Spraying Tillage Crop costs Crop Cost Agricultural Income Insurance Premiums (i.) $/ac x (a.) ac x (j.) yrs =
A. TOTAL ADDED REVENUES	D. TOTAL ADDED COSTS
REDUCED COSTS Overlap Costs = number of obstacles (sloughs) x $25/obst./yr x 10 yrs B. TOTAL REDUCED COSTS	REDUCED REVENUES Hay Revenue (f.) ac x (k.) t/ac x (l.) $/ton x 10 yrs = E. TOTAL REDUCED REVENUES
C. TOTAL ADVANTAGES (A+B)	F. TOTAL DISADVANTAGES (D+E)
NET CHANGE (C-F)	

Assumptions:

(a.) __ acres converted
(b.) __ years out of 10 harvested
(c.) __ years out of 10 flooded after seeding
(d.) yield __ bushels/acre
(e.) price __ $/bushel
(f.) __ acres hay
(g.) __ $/acre average annual income support payment (SCGA, CCDAP, Special Canadian Grains Programs, GRIP, FSAM, etc.)
(h.) __ years out of 10 income support payment is received
(i.) __ $/acre average annual income insurance premium
(j.) __ years out of 10 income insurance premium is paid
(k.) __ tons per acre
(l.) __ dollars per ton

Other considerations:
- Loss of benefits described under the "Wetland Benefits to Producers" section on pages 9 and 10 of this fact sheet. Although it is difficult to attach specific dollar amounts to many of these benefits, they are very important considerations.
- If you have your own equipment, add fuel costs and the cost of your time.
- Costs associated with draining all types of wetlands (temporary, permanent) are similar.

ECONOMIC WORKSHEET — WETLAND CONVERSION TO GRAIN
(ten year period)

(Actual sample prepared by a landowner near Indian Head, Saskatchewan)

ADVANTAGES **DISADVANTAGES**

Added Revenues		**Added Costs**	
Gross Revenue = (a.)ac x (d.)bu/ac x (e.)$/bu x(b.)yrs harvested 5 ac x 30 bu/ac x $3/bu x 7 = $3,150.00 Agricultural Income Support Revenue (g.)$/ac x (a.) ac x (h.) yrs = $8/ac x 5 ac x 9 yrs = $360.00		Operation Rate Cost Drainage 2.5 ac x $400 ac =$1,000.00 Breaking 200hp Cat 10hrs @ $62.64/hr=$626.40 Disc 5 ac x 3 passes x $14.81/ac =$222.15 Rock picking 4 hrs x $53.19/hr =$212.76 Spraying 2 litres Roundup/ac x 5 ac =$108.15 Tillage 5 acres 25' HD cult x $4.35/ac x 3 passes x 5 ac =$65.25 50' HD harrows x $1.78/ac x 2 passes x 5 ac=$17.80 Crop costs black soil zone Crop Cost stubble wheat 5ac x $67.96 x 7 yrs=$2,378.60 fallow wheat 5ac x $60.39 x 2 yrs =$603.90 fallow 5ac x $18.74 x 3 yrs =$281.10 Agricultural Income Insurance Premiums (i.) $/ac x (a.) ac x (j.) yrs = $2/ac x 5 ac x 9 yrs = $90.00	
A. TOTAL ADDED REVENUES	$3,510.00	D. TOTAL ADDED COSTS	= $5,606.11
REDUCED COSTS Overlap Costs = number of obstacles (sloughs) x $25/obst./yr x 10 yrs 5 sloughs x $25/obst./yr x 10 yrs = $1,250		REDUCED REVENUES Hay Revenue (f.) ac x (k.) t/ac x (l.) $/ton x 10 yrs = 2 ac x .75 t/ac x $50/t x 10 yrs = $750.00	
B. TOTAL REDUCED COSTS	$1,250.00	E. TOTAL REDUCED REVENUES	$750.00
C. TOTAL ADVANTAGES (A+B)	$4,760.00	F. TOTAL DISADVANTAGES (D+E)	$6,356.11
NET CHANGE Advantages/(-Disadvantages) (C-F) = (-$1,596.11)			

Assumptions:

(a.) 5 acres converted - 5 sloughs @ 1 acre each; half need drainage
(b.) 7 years out of 10 harvested (6 years stubble, 1 year fallow)
(c.) 2 years out of 10 flooded after seeding (1 year stubble, 1 year fallow)
(d.) yield 30 bushels/acre
(e.) price $3/bushel
(f.) 2 acres hay
(g.) $8/acre average annual income support payment (SCGA, CCDAP, Special Canadian Grains Programs, GRIP, FSAM, etc.)
(h.) 9 years out of 10 income support payment is received
(i.) $2/acre average annual income insurance premium
(j.) 9 years out of 10 income insurance premium is paid
(k.) 0.75 tons per acre
(l.) $50 per ton

Wetland Benefits to Producers

The value of a wetland is affected by many factors in the local landscape. This makes it difficult to assign a dollar value to wetland benefits for use in decision-making by a landowner. Often we don't realize what these benefits are until the wetland has disappeared, which makes it especially important to consider **all** the benefits when deciding how to manage wetlands.

Farm water supplies

Many wetlands, particularly the small temporary and seasonal ones, trap snowmelt and rainfall, then slowly release water down into the ground to recharge the water table. Over 90 per cent of Saskatchewan farms use wells for part of their water supply. The surface water is also useful for irrigation, livestock watering and sprayers.

Erosion control

By pooling water and slowing the flow of runoff, wetlands reduce soil movement. Instead of degrading the soil, water is allowed to percolate into the ground and help recharge the water table. The vegetation surrounding a wetland also helps slow wind speeds and reduce wind erosion.

Flood prevention

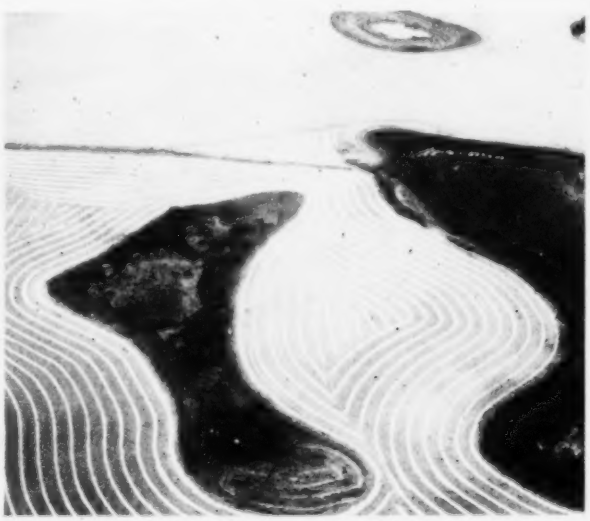
Wetlands provide temporary storage for runoff water. This reduces the amount of water entering the drainage channel, which in turn reduces the amount of downstream flooding. Draining and converting wetlands in favour of more arable acres may actually reduce available cropland if floods cause low-lying fields to remain excessively wet during spring seeding.

Affects local rainfall

Climatologists are finding that the cumulative drainage of even small wetlands over a whole region can have an affect on local rainfall patterns. Up to 95 percent of the water in some wetlands leaves through evaporation. It is now believed that this water may return as rainfall. Destruction of wetlands may lead to reduced annual regional precipitation.

Yields increase in land bordering wetlands

The water stored in a wetland also contributes to increased soil moisture in the wetland's border area. Depending on soil texture, slope, protection from wind and other factors, this extra soil moisture has been shown to increase crop yields. Producers who convert wetlands to cropland with the goal of increasing production may find that what they may gain in the converted area is lost in reduced productivity in the border area due to decreased soil moisture.



Hay and grazing for livestock

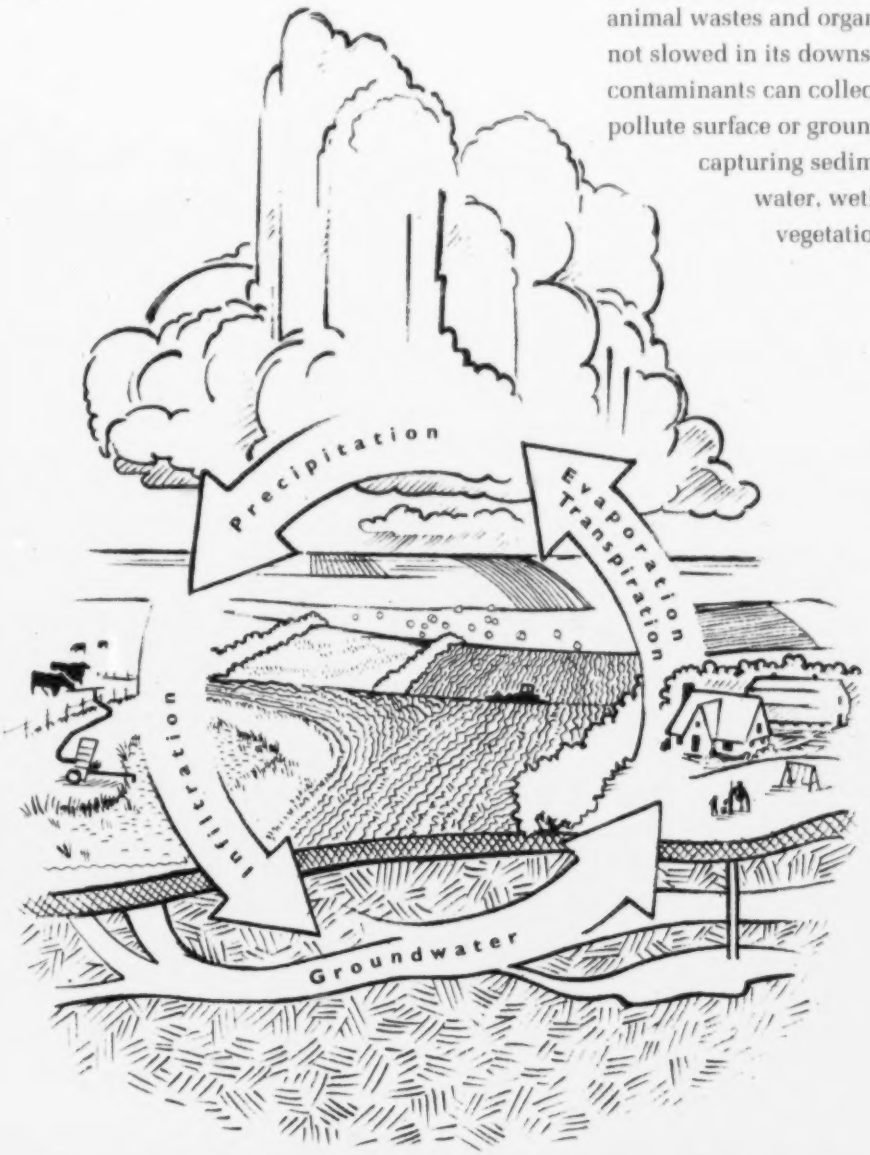
Livestock producers find wetlands and slough areas to be a valuable source of forage, especially during dry periods. Slough hay prospers when it has "wet feet". When spring water levels are controlled the common slough grasses, such as whitetop and slough sedge, can grow well in moderately saline soil and yields can range from 2 - 4.5 tons per acre with quality and palatability similar to tame, fertilized grasses. Contact forage specialists for details on "slough hay" management.

Home for plants and animals

Wetlands provide food, water and shelter for wildlife, such as deer, partridge, ducks and geese, as well as reptiles, amphibians, insects, and fur-bearers. Many of the prairie's endangered species, such as piping plovers and whooping cranes, depend on Saskatchewan's wetlands.

Nature's filters

Snowmelt or rainwater runoff may contain pesticide residue, nutrients from crop fertilizer, animal wastes and organic matter. If this water is not slowed in its downstream rush, these contaminants can collect in larger quantities and pollute surface or groundwater supplies. By capturing sediment and filtering runoff water, wetlands and their surrounding vegetation help to purify water.



THE WATER CYCLE

Wetland Management

How do wetlands affect salinity?

Salinity is a high concentration of naturally occurring salts in the soil. It often shows up in a white "bathtub ring" around wetlands, and many producers believe wetlands cause salinity. However, the opposite is usually true.

The salinity ring around a wetland usually results from tilling too close to the edge of the basin. This tillage exposes more soil and increases evaporation, which wicks soil moisture to the surface. When this moisture evaporates the salts remain in the band of tillage.

Salinity concentrates in wetland areas in two main ways. First, some wetlands (usually large wetlands) function as groundwater discharge basins. In other words, they work like springs, leaching groundwater out to the soil surface and picking up salts from the soil on the way. Upon reaching the surface, the water evaporates and the salt is deposited on the soil and/or the salt concentrates in the water.

The second key cause of soil salinity is the evaporation of water from the margins of the wetland, leaving an accumulation of salt (the "bathtub ring"). This water may evaporate from both the open water at the centre of the wetland and from seepage from the surrounding higher land.

However, if the water is transpired through plants, such as willows and permanent grasses, the salts tend to stay deeper, at the bottom of the root zone. Draining such saline wetlands may cause the water and salts to move further downslope, but will not likely reduce the salinity unless the former wetland area is kept in permanent vegetation.

For a wetland to be most effective, the area of vegetation surrounding the basin of water should be 10 metres (33 feet) from the high water mark. This will help eliminate the "bathtub ring" of salinity around the wetland caused by evaporation of soil moisture. This vegetation buffer will also help purify water entering the wetland and the groundwater system.

Water quality

Wetland quality may be improved by establishing vegetation around wetlands. This will reduce water velocity and allow sediments to settle out. The vegetation uses the nutrients and contaminants are trapped in the soil. The vegetation uses surplus water, which helps to control salinity.

Livestock grazing up to the water's edge destroy vegetation and create turbulence which contributes to reduced water quality. The wet basin may be fenced off and solar or wind-powered pumps used to carry the clean water a short distance to troughs.

Wetland Restoration and Reclamation

Small wetlands

If the basin and margin have not been cultivated, producers can restore small wetlands by simply plugging the drainage ditch to let the basin re-fill with water and allowing the surrounding vegetation to re-establish itself.

If the small wetland has been cultivated, aquatic vegetation will naturally re-establish itself in the basin through plant rhizomes and seeds remaining in the soil and those carried into the wetland by run-off or birds.

To prevent weeds from invading the margin, the wetland fringe should be re-seeded with seed mixes specifically blended for wetland restoration. Forage specialists should be consulted for advice on the best varieties for your area and intended use.

Willows or other trees may be planted near the water-upland boundary to help reduce soil surface wind speed and erosion, and to improve wildlife habitat. Contact the PFRA Shelterbelt Centre at Indian Head for technical advice and trees.

Recommendation

The decision to convert a wetland to cropland warrants the landowner's careful consideration on three elements: 1) direct dollar costs, 2) indirect costs, such as impact on soil quality, water supplies, diversity of farming operation, local wildlife, and 3) the off-farm impacts, such as neighbors' water supplies, downstream flooding, groundwater quality and quantity.

For more information about wetlands or on the economics of converting wetlands to croplands, contact the ***Saskatchewan Wetland Conservation Corporation****, Room 110-2151 Scarth Street, Regina, Saskatchewan, S4P 3Z3; telephone (306) 787-0726.*

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